the blue laser oscillator **21**B enter the collimator lenses **22**R, **22**G, and **22**B and subsequently enter the ribbon lines **24**R, **24**G, and **24**B of the GLV **24**, respectively.

[**0046**] The collimator lenses **22** convert the red, green, and blue light beams from the laser oscillator unit **21** into parallel light beams. The three color parallel light beams are condensed onto the GLV **24** by the cylindrical lens **23**. The condensed light beams are spatially modulated by the respective ribbon lines **24**R, **24**G, and **24**B of the GLV **24** separately driven according to image signals.

[**0047**] The modulated three color light beams are each condensed onto the volume hologram elements **25** by the cylindrical lens **23**. The red light beam is diffracted through the first volume hologram element **25***a* and the red light beam and the blue light beam are diffracted in the same direction through the second volume hologram element **25***b*. The green light beam is not diffracted through the first and second volume hologram elements **25***a* and **25***b*, and thus travels in straight lines to be emitted in the same direction as that of the red light. Thus, the red, green, and blues light beams are synthesized in the same direction by the volume hologram elements **25**. The synthesized light is scanned in predetermined directions at the galvanometer mirror **26** and finally projected onto the projection screen **10** through the projection lens **27**.

[**0048**] In the projection screen **10**, the three primary color light beams projected from the projector **20** enter the optical thin film **12** through the protective film **13**. In this instance, even if external light enters the optical thin film **12** with the three color light beams, the optical thin film **12** reflects only the three color light beams and absorbs at least visible light of the external light, as shown in **FIG. 3**. Thus, distinct images can be displayed even in a bright environment. When the three color light beams perpendicularly enter the optical thin film **12**, the rays of the light beams have predetermined incident angles with respect to the surface of the optical thin film **12**, at the convex portions **12**A. Accordingly, a predetermined percentage of the light in the three primary color wavelength bands is diffused at angles twice the incident angles.

[**0049**] As shown in **FIG. 3**, the maximum angle of the diffuse reflection of the light in the three primary color wavelength bands depends on the angle θ formed by the straight line connecting the boundary point **11***a* with the center of the sphere defined by the spherical surface of each convex portion **11**A and the normal to the surface of the top of the corresponding convex portion **11**A, and is 2θ. Consequently, since a predetermined percentage of the light is diffuse-reflected at angles up to 2θ, the viewing angle is increased and, consequently, viewing characteristics can be enhanced. Also, since the angle of the diffuse reflection depends on the convex portions **11**A of the substrate, the angle can be set by appropriately designing the convex portions **11**A.

[**0050**] In the present embodiment, the convex portions **11**A are provided on the surface of the substrate and the optical thin film **12** overlying the substrate **11** is also provided with convex portions **12**A having the same shape as that of the convex portions **11**A of the substrate **11**. The rays of light in three primary color wavelength bands incident on the optical thin film **12**, therefore, have predetermined incident angles with respect to the optical thin film **12**, at the convex portions **12**A of the optical thin film **12**, and are diffuse-reflected at angles twice the incident angles. Thus, a predetermined percentage of the light in the three primary color wavelength bands is diffused to increase the viewing angle of the screen. Consequently, distinct images can be obtained regardless of projection environment, and viewing characteristics can be enhanced. Also, since, by designing the convex portions **11**A of the substrate **11** according to an optical simulation or the like, the range of the diffuse reflection angle can appropriately be set, viewing characteristics can be controlled to further enhance.

[**0051**] In addition, since the convex portions **11**A allow light reflected from the optical thin film **12** to diffuse at a predetermined percentage, the resulting screen has a simple structure. As a result, the variation of optical characteristics, viewing characteristics, and other characteristics can be reduced. Accordingly, reliability is increased and manufacturing const is reduced.

[**0052**] Modification 1

[**0053**] Although, in the foregoing embodiment, the plurality of convex portions **11**A are provided on the surface of the substrate **11** to control diffuse reflection, concave portions **31**A may be formed on the surface of a substrate **31**, instead of the convex portions **11**A, as shown in **FIGS. 5 and 6**. **FIG. 6** does not show the parts above an optical thin film **32** for convenience.

[**0054**] A projection screen **30** including such a substrate **31** is manufactured according to the following. The substrate **31** is prepared from a macromolecular material containing a black paint as in the foregoing embodiment. The surface of the substrate **31** is subjected to, for example, embossing to form the concave portions **31**A. Each concave portion **31**A may have a curvature radius r of several micrometers to several millimeters. The shape, curvature radius r, arrangement, area ratio, surface properties, and the like of the concave portions **31**A are designed according to, for example, an optical simulation. Since the concave portions **31**A allow light reflected from the optical thin film **32** to diffuse at a predetermined percentage, the range of the diffuse reflection angle from the optical thin film **32** is appropriately set according to the design of the concave portions **31**A. The regions of the surface of the substrate **31** between the concave portions **31**A, incidentally, are flat.

[**0055**] The optical thin film **32** is deposited on the substrate **31** by, for example, sputtering. In this instance, the optical thin film **32** is formed so as to have concave portions **32**A having the same shape as that of the concave portions **31**A of the substrate **31**. The optical thin film **32** is a dielectric laminate essentially composed of high-refractive-index layers **32**H and low-refractive-index layers **32**L having a refractive index lower than that of the high-refractive-index layers that are alternately laminated. The thickness of the layers of the optical thin film **32** is set according to a simulation based on a matrix method so that, for example, the optical thin film **32** reflects light in three primary color wavelength bands and transmits other light in at least a visible wavelength band. Finally, the protective film **33** is formed on the optical thin film **32**. Thus, the projection screen **30** shown in **FIG. 5** is completed.

[**0056**] In the modification, the maximum diffuse reflection angle from the optical thin film **12** depends on the angle θ